

PATENT SPECIFICATION

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(54) IDLER RECOIL SUPPORT FRAME IN A TRACK-TYPE TRACTOR

(71) We, CATERPILLAR TRACTOR CO., a corporation organised and existing under the laws of the State of California, United States of America, of 100 N.E. Adams Street, Peoria, State of Illinois 61602, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a system in a tractor for allowing recoil of tractor idlers, and more particularly to such a system which incorporates sliding tubes for allowing such recoil.

Our U.S. Patents No. 3,825,309 and 3,829,172, disclose idler recoil systems incorporating a splined connection between an inner and an outer tube which allows reciprocation of one tube relative to the other, but limits rotative movement of one tube about its longitudinal axis relative to the other tube. While such systems have been found relatively effective in use, it will be understood that it is always desirable to improve on existing designs so as to increase overall manufacturing and operating efficiency. In particular, the splines of the inner tubular member are subjected to relatively great stress and wear, which may in turn result in cracking and, in the device of U.S. Patent No. 3,829,172, loss of high pressure fluid from a hydraulic adjuster chamber defined within such inner tubular member. It will be understood that variable stress loads in the walls of such a pressure chamber are undesirable because safety margins which would take into account such variation are extremely difficult to calculate.

In addition, the machining of the large number of splines involved in either system disclosed in U.S. Patent No. 3,829,172 or U.S. Patent No. 3,825,309 is costly and time-consuming, and there also exists the

problem of lack of and difficulty in providing positive retaining means which would keep the tubular members from inadvertently sliding apart if an assembled track did not encompass and secure the idlers and sprocket of the vehicle.

It is also to be understood that any slide and guide arrangement generally similar to the type disclosed in these patents should be properly lubricated and protected so as to ensure proper operation over a relatively long period of time.

Of more general interest in this area is U.S. Patent No. 3,343,889 wherein a bar includes a vertical slot entirely there-through, in which a plate fixed to a cylinder is slidable. It is to be noted that relatively large frictional areas are involved therein, and no lubrication is provided therefor.

It is accordingly an object of this invention to provide, in a track-type tractor or the like, means for allowing the reciprocation of one tubular member relative to another, meanwhile limiting rotative movement of one tubular member about its longitudinal axis relative to the other tubular member.

According to the invention, there is provided in a track-type tractor or the like, a frame structure comprising: a first generally tubular elongate member having at least one generally lateral aperture therein from outside to inside the first generally tubular elongate member; a second elongate member extending within the first generally tubular elongate member and recipricable therealong and relative thereto; a body positionable in said aperture; cooperating means associated with said second elongate member; one of said body and cooperating means defining a protrusion; the other of said body and cooperating means defining a slot with which said protrusion is engageable with said body so disposed in said aperture; means for retaining said body in said aperture said protrusion and slot allowing said

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reciprocation, meanwhile limiting rotative movement of the first elongate member about its longitudinal axis relative to the second elongate member.

5 In the accompanying drawings:

FIG. 1 is a side elevation of a track-type tractor incorporating a first embodiment of the invention;

10 FIG. 2 is a sectional view taken along the line II-II of FIGS 3;

FIG. 3 is a sectional view taken along the line III-III of FIG. 1;

15 FIG. 4 is a perspective view of the body incorporated in the first embodiment of the invention;

FIG. 5 is a sectional view taken along the line V-V of FIG. 6;

20 FIG. 6 is a sectional view similar to that shown in FIG. 3, but showing a second embodiment of the invention; and

FIG. 7 is a perspective view of a body used in the second embodiment of the invention as shown in FIGS. 5 and 6.

25 Shown in FIG. 1 is a track-type vehicle 10 having track assemblies on either side thereof, one of which is shown at 12. Such track assembly 12 includes a track frame structure 14 made up of a first track frame portion 16, and a second track frame portion 18. The frame portion 16 comprises a generally tubular elongate member, and the frame portion 18 comprises a generally tubular elongate member which extends within the generally tubular elongate member 16 and is reciprocable therealong and relative thereto. The elongate member 16 is made up of a tubular elongate member portion 20, and a pair of tubular members 22, 24 which are secured by welding to the elongate member 20 in a pair of horizontally aligned bores 26, 28 in the elongate member portion 20. Such tubular members 22, 24 are positioned so as to define first and second generally lateral apertures 30, 32 in the overall generally tubular elongate member 16, extending from outside to inside such generally tubular elongate member 16. Such apertures 30, 32 are spaced 180° apart, being positioned on opposite sides of the elongate member 16. The apertures 30, 32, it is to be noted, are substantially circular in configuration.

35 First and second covers 34, 36 are removably securable over such apertures 30, 32, by means of bolts 38 as shown. With the covers 34, 36 removed, bodies 40, 42, which are also substantially circular in configuration so as to be rotatable within the apertures 30, 32 respectively, may be fitted into such apertures 30, 32, and may be retained therein upon the securing of such covers 34, 36 to such tubular members 22, 24. Likewise, removal of the covers 34, 36 allows access to and removal of the bodies 40, 42 from the elongate member 16, if desired.

The bodies 40, 42 define protrusions 44, 46 which, with the bodies 40, 42 positioned in apertures 30, 32, may be aligned generally parallel to the longitudinal axis of the elongate member 16 through rotation of the bodies 40, 42 with the protrusions 44, 46 substantially 180° apart.

Cooperating means 48, 50 for association with such protrusions 44, 46 are associated with the second elongate member 18. Such cooperating means take the form of a portion 52 of the second elongate member 18 which defines slots 54, 56 disposed on either side thereof, substantially 180° apart, and are positioned so that they are engageable with the protrusions 44, 46 respectively when such bodies 40, 42 are retained in the apertures 30, 32 by the covers 34, 36. As shown in FIGS. 2 and 3, such slots 54, 56 are positioned generally parallel to the longitudinal axis of the elongate member 18, and the protrusions 44, 46 are sized so as to fit closely within the slots 54, 56. It is to be seen that the cooperation of the protrusions 44, 46 and slots 54, 56 allows reciprocation of the first and second elongate members 16, 18 relative to each other, meanwhile limiting rotative movement of one elongate member about its longitudinal axis relative to the other elongate member. Through such means, the frame portions 16, 18 are kept in substantial alignment.

Each body 40, 42 includes upper and lower appendages 58, 60 to provide additional pilot surface for that body in the associated aperture, to resist cocking of that body in the aperture, as well as to provide additional bearing surface to resist vertical loads on the body. Because of the substantially circular configurations of the apertures 30, 32 and bodies 40, 42 fitted therein, each body is free to rotate in its associated aperture, to aid in aligning the elongate protrusion with the slot associated therewith at assembly, and to ensure that the protrusions 44, 46 follow the slots 54, 56 without binding as the elongate member 16 reciprocates fore and aft relative to the elongate member 18. Providing that such bodies 40, 42 may rotate in accordance with the above description allows for slight misalignment which may take place between associated elements. It is to be noted that the bodies 40, 42 defining the slots 54, 56 are enclosed within the generally tubular elongate member 16.

A seal 62 is provided adjacent bearing 64 of elongate tubular member 18, to sealingly connect the elongate member 16 and elongated member 18. The covers 34, 36 are provided with seals 66, so as to sealingly engage the tubular members 22, 24. Such appropriate sealing provides a sealed cavity area 68 between elongate tubular member 16 and elongate tubular member 18 there-

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within, which is approximately half filled with oil. Such oil acts as a lubricant in the area of the sliding of the protrusions 44, 46 and cooperating means 48, 50 defining the slots 54, 56. Reciprocation of one elongate member relative to another ensures that oil is properly provided to such areas.

It is to be noted that the bodies 40, 42 are of softer material than the cooperating means 48, 50 which define the slots 54, 56. Thus, almost all of the wear which results from the reciprocating motion above described will be on the protrusions 44, 46 of such bodies 40, 42, which, it will be seen, are readily replaceable. Such replacement can of course be undertaken upon removal of the covers 34, 36, removal of the bodies 40, 42, insertion of other bodies into the apertures 30, 32, and replacement of the covers 34, 36.

Secured to the elongate member 18 as a portion thereof is an annular flange 70. Such flange 70 is positioned relative to the slots 54, 56 so that upon extreme rightward movement of the elongate member 18 relative to the elongate member 16, flange 70 will contact the protrusions 44, 46 of the bodies 40, 42. Such flange 70 thereby acts as stop means to limit relative movement of the first and second elongate members 16, 18 in one direction. In order to allow further relative movement of the first and second elongate members in such one direction, beyond the position determined by the stop means, the covers 34, 36 are removed, and the bodies 40, 42 are then in turn removed, to allow such further movement.

Pressure applied through a grease fitting 72 associated with a cylinder 74 is used to provide adjustment of the overall track frame. The cylinder 74 is maintained in a vertical position by a "V" shaped member 76 welded to an abutment plate 78 fixed relative to the elongate member 16, and a mating cavity 80 formed in the end of the cylinder 74 to accept the member 76. In order to remove the elongate member 18 from the elongate member 16 for replacement of seals, bearing, etc., the pressure in the cavity of cylinder 74 is vented by partial removal of a vent 82. The covers 34, 36 and bodies 40, 42 are then removed as described above, permitting the elongate member 18 to be pulled forward from the elongate member 16. To ensure that the cylinder 74 remains on the flange 70 with which it is associated, a cable 84 is secured between the cylinder 74 and flange 70 of the elongate member 16.

Shown in Figs. 5, 6 and 7 is another embodiment of the invention. Similar to the previous embodiment, this embodiment includes a first generally tubular elongate member 90, and a second generally tubular elongate member 92 extending within the

tubular member 90 and reciprocable therealong and relative thereto. In this embodiment, however, circular bodies 94, 96, retained in circular apertures 98, 100 by means of covers 102, 104, define slots 106, 108 respectively (see Fig. 7). Such bodies 94, 96 are of course removable from the elongate member 16 in the same manner as the bodies described in relation to the previous embodiment. In this embodiment, the cooperating means comprise a pair of members 110, 112, each comprising a main portion 114 and a protrusion 116, such main portion 114 including a circular portion 118 which is a light press fit in a hole defined by the elongate member 92. The main portion 114 also includes a second circular portion 120 which is a light press fit in a circular hole defined by yet another tubular member 122, so that each member 110, 112 is removably fixed to the elongate member 92 and the member 122. With such members 110, 112 fixed in place as shown in Figs. 5 and 6, the protrusions 116 are engaged with the slots 116, 108, to allow such reciprocating motion of the elongate member 90 relative to the elongate member 92, meanwhile limiting rotative movement one elongate member about its longitudinal axis relative to the other elongate member. The protrusions 116 are square in configuration and nest properly in the complimenting slots 106, 108. Coupling bolts 124 and index pins 126 connect the elongate member 92 and the tubular member 122. However, most torsional loading is absorbed by the main portions 114 of the members 110, 112, each main portion 114, as described above, being a light press fit in the holes of the members 92, 122 associated therewith. Thus, the coupling bolts 124 and index pins 126 are substantially isolated from such torsional loading.

Detachment of the covers 102, 104, similar to the previous embodiment, allows for inspection and/or service of the bodies 94, 96 and protrusions 116. If wear is sufficient on such protrusions 116, the members 110, 112 may be rotated. The removal and rotation of such members 110, 112 can be effected by threadably attaching suitable tools into puller holes 128 provided in each protrusion. Such operation can be done conveniently and without disrupting any other part of the structure.

It is again to be seen that, since the apertures 98, 100 and bodies 94, 96 are substantially circular in configuration, alignment of the bodies 94, 96 relative to the protrusions 116 is promoted, all as described in relation to the previous embodiment. Also similar to the previous embodiment, a level of lubricating fluid is contained within the tubular elongate member 90, and appropriate seals are provided, so that adequate lubrication is

assured between the protrusions 116 and the bodies 94, 96 defining the slots 106, 108.

WHAT WE CLAIM IS:-

1. In a track-type tractor or the like, a frame structure comprising:
 - a first generally tubular elongate member having at least one generally lateral aperture therein from outside to inside the first generally tubular elongate member;
 - a second elongate member extending within the first generally tubular elongate member and reciprocable therealong and relative thereto;
 - a body positionable in said aperture;
 - a cooperating means associated with said second elongate member;
 - one of said body and cooperating means defining a protrusion;
 - the other of said body and cooperating means defining a slot with which said protrusion is engageable with said body so disposed in said aperture;
 - means for retaining said body in said aperture, said protrusion and slot allowing said reciprocation, meanwhile limiting rotative movement of the first elongate member about its longitudinal axis relative to the second elongate member.
2. A structure as claimed in claim 1 wherein the aperture defined by the first elongate member is substantially circular, and the body is substantially circular in configuration and sized to rotatably fit within said circular aperture.
3. A structure as claimed in claim 1 or 2 wherein said body defines said protrusion.
4. A structure as claimed in claim 1 or 2 wherein said body defines said slot.
5. A structure as claimed in any preceding claim, wherein the means for retaining the body in said aperture comprise removable cover means, the removal of which allows access to and removal of said body from said first elongate member.
6. A structure as claimed in claim 1 wherein the first elongate member defines a second generally lateral aperture therein from outside to inside the first elongate generally tubular member, the first-mentioned and second apertures being positioned on one and the other opposite sides of the first elongate member, and further comprising a second body positionable in said second aperture, second cooperating means associated with said second elongate member, one of said second body and second cooperating means defining a second protrusion, the other of said second body and second cooperating means defining a second slot with which said second protrusion is engageable with said second body disposed in said second aperture, and means for retaining said second body in said second

aperture, said protrusions and slots allowing said reciprocation, meanwhile limiting rotative movement of the first elongate member about its longitudinal axis relative to the second elongate member.

7. A structure as claimed in claim 6, wherein the first and second apertures defined by the first elongate member are substantially circular, and the first-mentioned and second bodies disposed therein are substantially circular in configuration so as to rotatably fit within said first and second apertures respectively.

8. A structure as claimed in claim 7 wherein said first and second bodies define said first-mentioned and second protrusions respectively.

9. A structure as claimed in claim 7 wherein said first and second bodies define said first-mentioned and second slots respectively.

10. A structure as claimed in claim 8 wherein the means for retaining the first and second bodies in said first and second apertures comprise first and second removable cover means securable relative to said first elongate member, the removal of which allows access to and removal of said first and second bodies respectively from said first elongate member.

11. A structure as claimed in claim 9 wherein the means for retaining the first and second bodies in said respective first and second apertures comprise first and second removable cover means securable relative to said first and second elongate members, the removal of which allows access to and removal of said first and second bodies respectively from said first elongate member.

12. A structure as claimed in claim 1 wherein said body defines said protrusion and further comprising stop means secured relative to the second elongate member and positioned to be contacted by the body positioned in the aperture to limit relative movement of the first and second elongate members in one direction.

13. A structure as claimed in claim 12 wherein the means for retaining the body in the aperture comprise removable means the removal of which allows removal of the body from the first elongate member, whereby relative movement of the first and second elongate members in said one direction, beyond the position determined by the stop means, is allowed.

14. A structure as claimed in any preceding claim, wherein the body is of softer material than the cooperating means.

15. A structure as claimed in claim 14 wherein said body defines a protrusion.

16. A tracked vehicle substantially as described with reference to Figures 1 to 4 or 5 to 7 of the accompanying drawings.



assured between the protrusions 116 and the bodies 94, 96 defining the slots 106, 108.

5 WHAT WE CLAIM IS:-

1. In a track-type tractor or the like, a frame structure comprising:

5 a first generally tubular elongate member having at least one generally lateral aperture therein from outside to inside the first generally tubular elongate member;

10 a second elongate member extending within the first generally tubular elongate member and reciprocable therealong and relative thereto;

15 a body positionable in said aperture;

a cooperating means associated with said second elongate member;

20 one of said body and cooperating means defining a protrusion;

the other of said body and cooperating means defining a slot with which said protrusion is engageable with said body so disposed in said aperture;

25 means for retaining said body in said aperture, said protrusion and slot allowing said reciprocation, meanwhile limiting rotative movement of the first elongate member about its longitudinal axis relative to the second elongate member.

30 2. A structure as claimed in claim 1 wherein the aperture defined by the first elongate member is substantially circular, and the body is substantially circular in configuration and sized to rotatably fit within said circular aperture.

35 3. A structure as claimed in claim 1 or 2 wherein said body defines said protrusion.

40 4. A structure as claimed in claim 1 or 2 wherein said body defines said slot.

45 5. A structure as claimed in any preceding claim, wherein the means for retaining the body in said aperture comprise removable cover means, the removal of which allows access to and removal of said body from said first elongate member.

50 6. A structure as claimed in claim 1 wherein the first elongate member defines a second generally lateral aperture therein from outside to inside the first elongate generally tubular member, the first-mentioned and second apertures being positioned on one and the other opposite sides of the first elongate member, and further comprising a second body positionable in said second aperture, second cooperating means associated with said second elongate member, one of said second body and second cooperating means defining a second protrusion, the other of said second body and second cooperating means defining a second slot with which said second protrusion is engageable with said second body disposed in said second aperture, and means for retaining said second body in said second

aperture, said protrusions and slots allowing said reciprocation, meanwhile limiting rotative movement of the first elongate member about its longitudinal axis relative to the second elongate member.

70 7. A structure as claimed in claim 6, wherein the first and second apertures defined by the first elongate member are substantially circular, and the first-mentioned and second bodies disposed therein are substantially circular in configuration so as to rotatably fit within said first and second apertures respectively.

75 8. A structure as claimed in claim 7 wherein said first and second bodies define said first-mentioned and second protrusions respectively.

80 9. A structure as claimed in claim 7 wherein said first and second bodies define said first-mentioned and second slots respectively.

85 10. A structure as claimed in claim 8 wherein the means for retaining the first and second bodies in said first and second apertures comprise first and second removable cover means securable relative to said first elongate member, the removal of which allows access to and removal of said first and second bodies respectively from said first elongate member.

90 11. A structure as claimed in claim 9 wherein the means for retaining the first and second bodies in said respective first and second apertures comprise first and second removable cover means securable relative to said first and second elongate members, the removal of which allows access to and removal of said first and second bodies respectively from said first elongate member.

95 12. A structure as claimed in claim 1 wherein said body defines said protrusion and further comprising stop means secured relative to the second elongate member and positioned to be contacted by the body positioned in the aperture to limit relative movement of the first and second elongate members in one direction.

100 13. A structure as claimed in claim 12 wherein the means for retaining the body in the aperture comprise removable means the removal of which allows removal of the body from the first elongate member, whereby relative movement of the first and second elongate members in said one direction, beyond the position determined by the stop means, is allowed.

105 14. A structure as claimed in any preceding claim, wherein the body is of softer material than the cooperating means.

110 15. A structure as claimed in claim 14 wherein said body defines a protrusion.

115 16. A tracked vehicle substantially as described with reference to Figures 1 to 4 or 5 to 7 of the accompanying drawings.

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